

**This Page Is Inserted by IFW Operations
and is not a part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- **BLACK BORDERS**
- **TEXT CUT OFF AT TOP, BOTTOM OR SIDES**
- **FADED TEXT**
- **ILLEGIBLE TEXT**
- **SKEWED/SLANTED IMAGES**
- **COLORED PHOTOS**
- **BLACK OR VERY BLACK AND WHITE DARK PHOTOS**
- **GRAY SCALE DOCUMENTS**

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**

CLAIMS:

- Sub A' →
1. A method of forming a plastics material article, consisting in the steps of:
- forming an injection moulded preform between a pair of complementary mould parts, which define an initial mould cavity for injection of the preform,
 - 5 • separating the one of the complementary mould parts (hereinafter "the Substitutable Mould Part") from the preform,
 - replacing the Substitutable Mould Part with one or more replacement mould parts (hereinafter "the Replacement Mould Part(s)") to enlarge the mould cavity so as to allow stretching of the preform,
 - 10 • stretching at least part of the preform away from the other of the complementary mould parts (hereinafter "the Base Mould Part") for the forming of it to a finished article shape against the Replacement Mould Part and
 - removing the Replacement Mould Part(s) for release of the finish formed
 - 15 article.
2. A forming method as claimed in claim 1, wherein the Substitutable Mould Part is separated from the preform after the latter has skinned against it, but before the preform has solidified throughout its thickness, at least in the portion of it to be stretched.
- Sub A2 →
- 20 3. A forming method as claimed in claim 1 or claim 2, including injection of gas between it and the Base Mould Part to separate at least part of the preform from the Base Mould Part.
4. A forming method as claimed in any preceding claim, wherein the stretching of the preform is effected by injection of gas between it and the Base Mould Part.
- 25 5. A forming method as claimed in any preceding claim, wherein the stretching of the preform is effected by lifting a portion of the preform from at least part of a main piece of the Base Mould Part by a movable piece of the Base Mould Part.
6. A forming method as claimed in claim 5, wherein the lifted portion of the preform is moved by the movable piece of the Base Mould Part as far as a
- 30 corresponding piece of the Replacement Mould Part(s).
7. A forming method as claimed in claim 6, wherein the lifted portion of the preform is captivated between the movable piece of the Base Mould Part and the

corresponding piece of the Replacement Mould Part(s) at the end of the stroke of the movable piece.

8. A forming method as claimed in claim 7, wherein the captivation of the lifted portion of the preform temporarily seals apertures in the lifted portion.

9. A forming method as claimed in any one of claims 5 to 8 as appendant to claim 4, wherein the injection of gas is started before the movable piece of the Base Mould Part is moved.

10. A forming method as claimed in any one of claims 5 to 8 as appendant to claim 4 or in claim 9, wherein the injection of gas is started before the replacement with the Replacement Mould Part(s) is complete.

11. A forming method as claimed in any preceding claim, wherein the preform is attached to a main piece of the Base Mould Part by virtue of this piece being polished, at least locally.

12. A forming method as claimed in any preceding claim, wherein the preform is stretched from a portion of it temporarily captivated by the Replacement Mould Part(s).

13. A forming method as claimed in any preceding claim, wherein the preform is stretched to substantially the final shape of the finish formed article.

14. A forming method as claimed in any preceding claim, wherein a stretched portion of the preform is urged into contact with the Replacement Mould Part(s) for its final temperature control by application of increased gas pressure on the Base Mould Part side of the preform (which may be from gas applied for lifting and/or stretching of the preform) and/or by application of reduced gas pressure on the Replacement Mould Part(s) side of the preform.

15. A forming method as claimed in any preceding claim, wherein the enlarged mould cavity is defined by a plurality of Replacement Mould Parts.

16. A forming method as claimed in claim 15, wherein the enlarged mould cavity is assembled by radial movement of the Replacement Mould Parts into their replacement position.

17. A forming method as claimed in claim 15, wherein the enlarged mould cavity is assembled by pivotal movement of the Replacement Mould Parts into their replacement position.

18. A forming method as claimed in claim 15, claim 16 or claim 17, wherein the plurality of Replacement Mould Parts are provided with ducts for temperature control

Sub A³ →

Sub A⁴ →

fluid and the article is brought to the temperature required for it to be sufficiently rigid for its removal by passage of temperature control fluid through the ducts after stretching and prior to opening of the Replacement Mould Parts.

19. A forming method as claimed in anyone of claims 1 to 14, wherein the
5 enlarged mould cavity is defined by a single, or one per impression where the tool has multiple impressions, Replacement Mould Part moved bodily into its replacement position

20. A forming method as claimed in claim 19, wherein the or each single
Replacement Mould Part is provided with ducts for temperature control fluid and the
10 article is brought to the temperature required for it to be sufficiently rigid for its removal by passage of temperature control fluid through the ducts after stretching and prior to opening of the Replacement Mould Part(s).

21. A forming method as claimed in claim 19, wherein the single Replacement
Mould Part is provided with ducts for temperature control fluid and the article is
15 brought to the temperature required for it to be sufficiently rigid for its removal by passage of temperature control fluid through the ducts after stretching and both prior to and after removal of the Replacement Mould Parts.

22. A forming method as claimed in any one of the preceding claims, wherein the stretched portion of the preform is stretched by between a factor of 2:1 and 4:1.

23. A tool for forming a plastics material article in accordance with claim 1, the tool comprising:

- a Base Mould Part, preferably a core part,
- a Substitutable Mould Part, preferably a first cavity part,
 - the Base and Substitutable Mould Parts defining an initial mould cavity
25 between them for injection moulding of the preform and being axially movable for separation of the Substitutable Mould Part from the preform,
- one or more Replacement Mould Parts movably carried by the Base Mould Part or the Substitutable Mould Part, for movement from a withdrawn position
30 to an advanced position in which it or they provide an enlarged mould cavity defining the outside shape of the finish formed article.

24. A mould tool as claimed in claim 23, including a movable rim forming member, which is slidable mounted on the Base Mould Part for movement, from a

Sub A^s

Sub B²

rest position in which the Substitutable Mould Part abuts it for moulding of a rim of the article and in which the Replacement Mould Part(s) abut it for captivation of the rim on stretching of the preform, to an advanced position for ejecting the finish formed article.

Sub A⁶ → 25. A mould tool as claimed in claim 23 or claim 24, wherein the or each Replacement Mould Part has temperature control fluid ducts.

26. A mould tool as claimed in claim 23, claim 24 or claim 25, wherein the Base Mould Part has a movable piece, for lifting a portion of the preform from the Base Mould Part, the movable piece being adapted to seal with a main piece of the Base Mould Part on injection of plastics material.

27. A mould tool as claimed in claim 26, wherein the movable piece has a face shaped complementarily with both the opposite face of the Substitutable Mould Part and the Replacement Mould Part(s), whereby the liftable portion of the preform is moulded to final shape in the initial mould cavity.

15 ~~28. A mould tool as claimed in claim 27, wherein the mould parts are shaped to form one or more apertures in the liftable portion.~~

Sub A⁷ → 29. A mould tool as claimed in claim 26, claim 27 or claim 28, including a pressure gas connection internally of the said main piece and the liftable piece of the Base Mould Part, whereby pressure gas can be introduced on the Base Mould Part side of the preform on lifting of the liftable piece via an aperture in the said main piece normally closed by the liftable piece.

30. A mould tool as claimed in any one of claims 23 to 29, wherein a plurality of Replacement Mould Parts are translationally mounted on the Base Mould Part for movement to form the enlarged cavity and means is provided for moving the Replacement Mould Parts between their withdrawn position and their advanced position.

31. A mould tool as claimed in claim 23 to 29, wherein a plurality of Replacement Mould Parts are pivotally mounted on the Base Mould Part for movement to form the enlarged cavity and means is provided for moving the Replacement Mould Parts between their withdrawn position and their advanced position.

32. A mould tool as claimed in claim 31, wherein the means for moving the Replacement Mould Parts includes a slidable member mounted on the Base Mould Part and respective connecting rods connecting the slidable member and the Replacement Mould Parts, the slidable member and the rods being arranged for

advance and withdrawal of the Replacement Mould Parts between a withdrawn position in which the Substitutable Mould Part can close on the Base Mould Part and an advanced position in which the Replacement Mould Parts can close on the Base Mould Part.

Sub A8

33. A mould tool as claimed in any one of claims 23 to claim 29, wherein a single, or one per impression where the tool has multiple impressions, Replacement Mould Part is translationally mounted on the Substitutable Mould Part or on the Base Mould Part for bodily movement to provide the enlarged cavity.

34. A mould tool as claimed in claim 33, including a vacuum duct in the Replacement Mould Part extending from an external vacuum connection point to at least one internal vacuum point opening into the enlarged cavity, whereby the finish formed article can be held in the enlarged cavity on withdrawal of the Replacement Mould Part from the Base Mould Part.

Sub A9

35. A mould tool as claimed in claim 33 or claim 34, including:

- a first slide and actuator carried on the Substitutable Mould Part or on the Base Mould Part, the slide extending at least substantially radially of a centreline of the mould tool,
- a Replacement Mould Part carrier slidably mounted on the slide under control of the actuator and
- a second slide and actuator carried on the carrier and extending at least substantially parallel to the centreline of the mould tool, the Replacement Mould Part being mounted on the second slide under control of the second actuator.

36. A mould tool as claimed in claim 35, in combination with a control system adapted and arranged for:

- actuation of the first actuator for inwards radial movement of the carrier and Replacement Mould Part after opening of the Substitutable Mould Part to align the Replacement Mould Part with the Base Mould Part and outwards after stretching of the preform
- reciprocating actuation of the second actuator for axial movement of the Replacement Mould Part into abutment with the Base Mould Part for stretching of the preform and out of abutment after stretching of the preform.

Sub A¹⁰ →

37. A finish formed article made in accordance with the method of anyone of claims 1 to 22.